Coalition Search and Rescue – Task Support (CoSAR-TS)

Technical Proposal and Statement of Work

Period of Performance
January 2003 to December 2005

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Prepared by
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Type of Business
Educational University

US Government Fiscal Years				
	FY 2003	**FY 2004**	**FY 2005**	**Total**
Total Cost	**$140,000.00**	**$85,000.00**	**$36,500.00**	**$261,500.00**

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COSAR-TS is a project to link domain and task management software agents with human agents to allow for a common shared "intelligible" model of tasks, processes, organizational structure, capabilities, agent status and presence, conversation policies, authorities and obligations and to explore this in a realistic application. Features of the work are the re-use of suitable ontologies (such as those provided in the DAML and DAML-S work) to act as the basis for this work, feedback to the contributing research communities and feed forward into a number of programs interested in the results.

The research plan is to explore the synergies between work at AIAI on I-X technology (www.i-x.info) for tasks, processes, collaboration, agent status and presence, workflow and activity management and the UWF/IHMC KAoS approach to agent domain management along with policies to govern their interaction. The area of overlap is the use of a shared or common description of tasks, processes and activities and the related knowledge associated with these.

Outreach opportunities to a number of interested parties are planned. The project is proposed to be of 3 years duration from 1st January 2003 to allow overlap with transition opportunities into the major NWDC/Pinnacle Challenge '05 exercise, and possible ahead of that with SPAWAR, USPACOM, MPAT, TTCP, DARPA, AFRL and C-CINC21, which are opportunities actively under discussion with those involved.

1.0 Technical Approach

1.1 Technical Discussion

Ontologies and their (Re-)use

The representation of tasks, processes, agent organisational structure, capabilities, conversation policies, authorities and obligations are not areas where the current DAML program effort is focussed, though that is now changing as DAML-S and other capability description work comes on stream. But, of course, these areas are fundamentally important to any performative system. Hence the work suggested both complements the current work on DAML/RKF, and provides a setting for realistic use and directive feedback for those engaged on developing the currently emerging suggestions from DAML/RKF.

AI Planning Technology

Intelligent planning technology from the AI community has been developed over a long period. Contrary to popular belief, these technologies have been widely deployed in productive applications. Examples include the Optimum-AIV planner for Ariane IV rocket launcher assembly, integration and test (based on O-Plan); planners in biped robots (Honda, based on Nonlin); military work-around planning from George Mason University (based on Nonlin); the Pro-Act planner at Amoco (based on Nonlin and SIPE), etc. The simple but effective techniques of Hierarchical Task Network (HTN) planning have been easily reproduced and included in many applications. But the main planning systems available to the research and applications

community have typically been research prototypes developed over a long period with many features to support a wide variety of experiments.

In spite of this, when surveys are done by companies and organizations of systems that suit their needs for a variety of difficult planning tasks, systems like O-Plan and SIPE frequently top the lists of potential systems to fulfil the needs. Recent examples of this are studies undertaken in the US (Boeing and Honeywell) and separately in the UK (DERA/QinetiQ) to find systems suitable for planning and reactive plan execution support for Unmanned Autonomous Vehicles (UAVs). O-Plan and SIPE once again figured in the short list or even topped the list of candidates in these studies. But, these systems are not suitable for deployment. The successful uses of the technology they exhibit have typically involved rewriting the algorithms or reusing the plan representations, but have not used the code of these systems – other than for rapid proof of concept, prototyping or risk reduction at the early stages.

I-X Technology and its Relevance

The I-X research program began in 2000 at Edinburgh to rectify this situation. It took the best and core aspects of the O-Plan approach that had been developed with DARPA, AFRL and UK Science Research Council support and generalised this to be much more easily understood and deployed. The code to support this new work is all in Java to encourage re-usability and portability. The core O-Plan approach has been re-presented as combining, in an opportunistic fashion, a top-down goal or requirements driven aspect (called "issue-addressing") with a bottom-up constraint checking aspect (called "constraint handling"). *[This combination of top down logical reasoning with bottom up search pruning is a powerful approach that others have also explored and are promoting – even some previous advocates of logic programming such as Bob Kowalski now advocate this mixed approach. For example, Bob Kowalski notes in his on–line biography at http://www-lp.doc.ic.ac.uk/UserPages/staff/rak/history.html the realisation that, as a model of computation and reasoning, logic programming was much more restricted then he had previously realised, but that most of what was missing was provided by integrity constraints checking.]*

Supporting the issue addressing and constraint-addressing architectural approach of I-X is an underlying conceptual model or ontology termed <I-N-C-A> - Issues, Nodes, Constraints and Annotations. This allows a space of artifacts (such as a design or a plan) to be described as a set of nodes that it contains (such as sub-parts or activities), a set of constraints on how those nodes are combined or configured, a set of outstanding issues that the artifact does not yet address (such as unsatisfied requirements, or broken constraints) and a s set of annotations used to record justifications or rationale for the artifact's design choices. <I-N-C-A> is well suited to the communication and exchange of designs or plans between human and system agents and components. XML descriptions support this interchange in an open way.

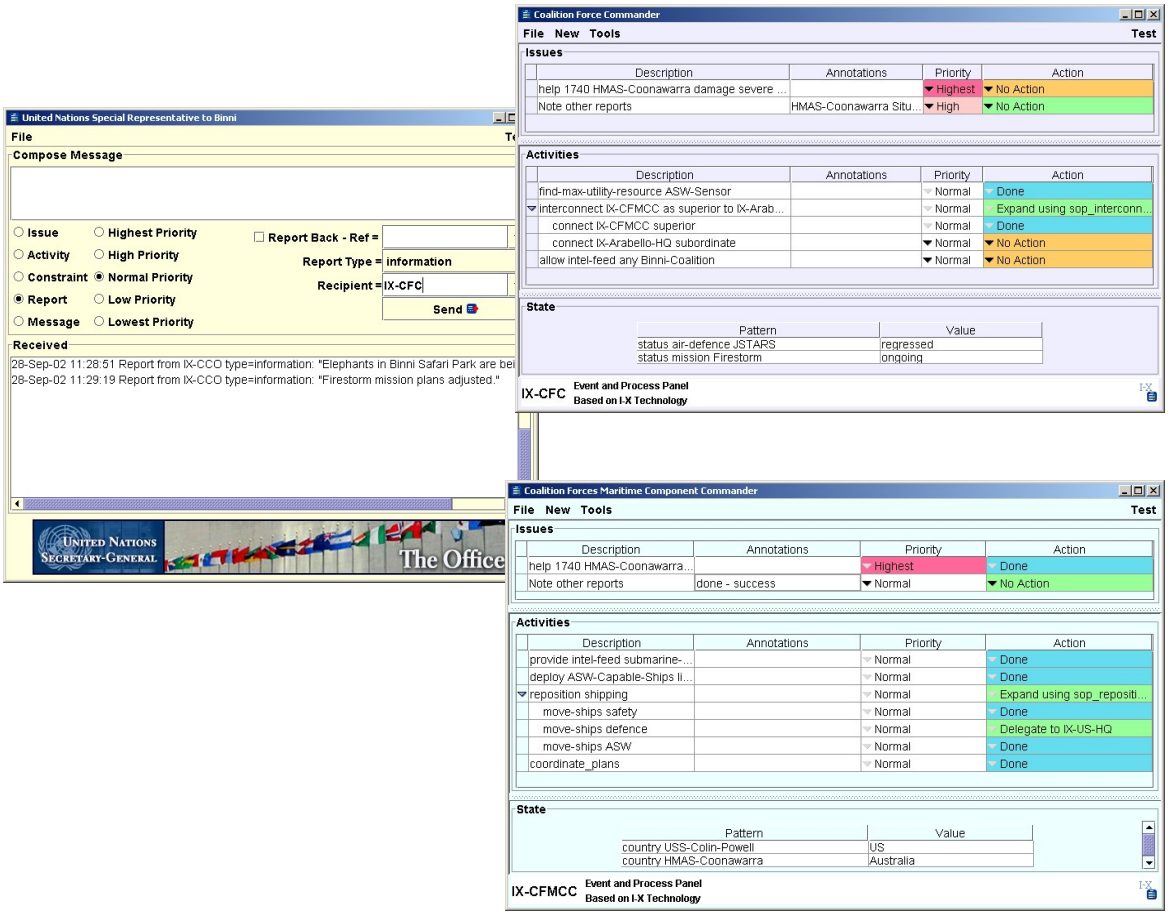
An I-X Process Panel (I-P^2) acts as a workflow, reporting and messaging "catch all" for its user. It can act in conjunction with other panels for other users if desired.

- Can take ANY requirement to:
  - Handle an issue
  - Perform an activity
  - [later: Maintain a constraint]
  - [later: Note an annotation]

- Deals with these via:
  - Manual (user) activity
  - Internal capabilities
  - External capabilities (invoke or query)
  - Reroute or delegate to other panels or agents (escalate, pass or delegate)
  - Plan and execute a composite of these capabilities (expand)

- Receives reports and messages and, where possible, interprets them to:
  - Understand current status of issues, activities, constraints and annotations
  - Understand current world state, especially status of process products
  - Help control the situation

- Copes with partial knowledge

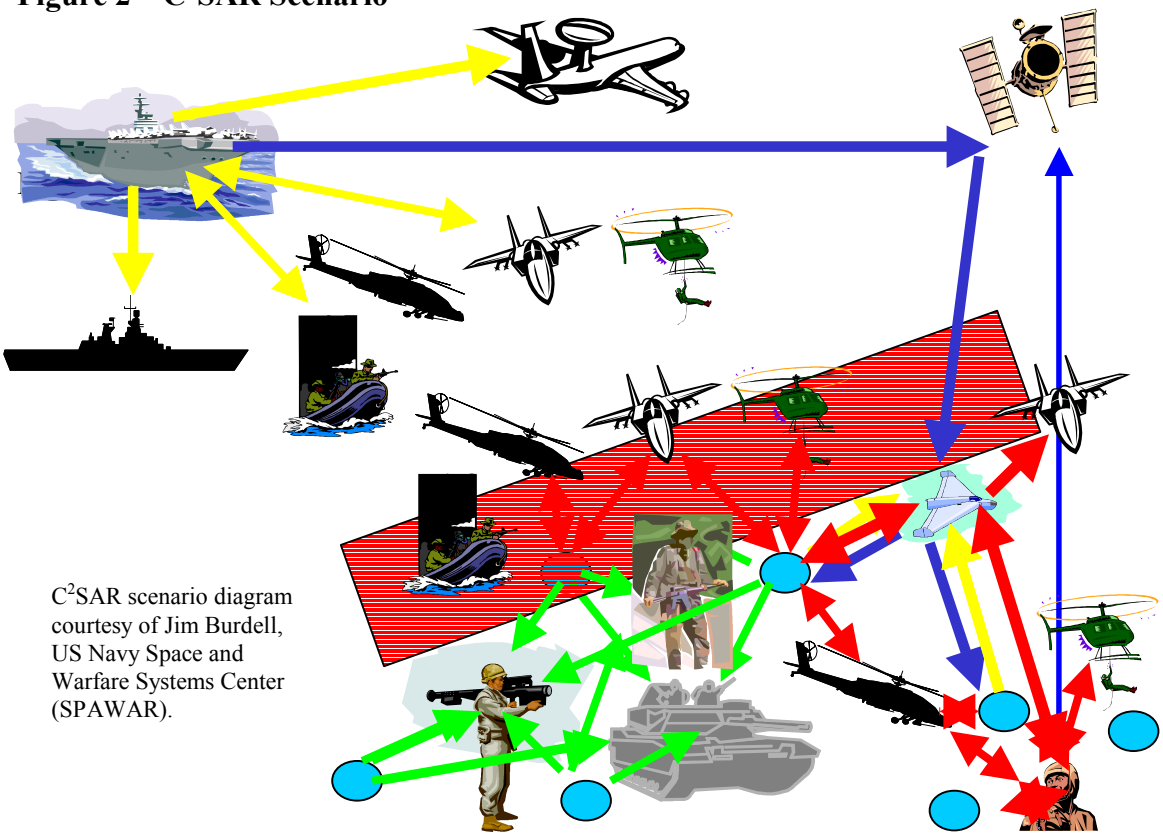


Three example process panels are shown in figure 1. These panels are from a demonstration of agent systems within a military Coalition context – part of the Coalition Agents eXperiment – CoAX (Allsopp et.al. 2001, 2002).

Coalition Command and Control Search and Rescue Scenario

The chosen C^{2}SAR scenario involves two different downed airman situations – one on land and one in the sea. The scenario follows on from the events in the Coalition Agents eXperiment (CoAX) Binni 2002 demonstration and utilizes the scenario material and context from that demonstration. Groups to which the results of the proposed work are aimed are exploring such Search and Rescue scenarios.

Figure 2 – C^{2}SAR Scenario



C^{2}SAR scenario diagram courtesy of Jim Burdell, US Navy Space and Warfare Systems Center (SPAWAR).

DAML and RKF Ontologies and their Relevance

The requirement to share plan and process knowledge arises as soon as we consider two or more computational agents, e.g. planning and scheduling systems, or consider the need for human-computer interaction. Reaching a consensus on the basic elements of a plan representation has been more difficult than for other areas where generic ontologies have been developed. During the development of the Process Specification Language (PSL) (Schlenoff, 1999) many previous plan formalisms were considered, and this language is in the process of standardization. However, PSL has not yet been widely adopted. While PSL specifies the semantics of primitive relations between objects, activities and timepoints, DAML-S provides a higher-level vocabulary,

which is as yet ungrounded (as regards PSL-level relations). The Script vocabulary developed in the RKF program is both high-level and grounded, but is grounded in primitive CycL relations (Aitken and Curtis 2002). Work is also underway on the DAML program and other DARPA efforts that aims to describe the capabilities of agents. Many common intuitions lie behind these languages/ontologies, but significant differences in level of abstraction, scope, and knowledge representation language exist. The CoSAR-TS project will explore the (re)usability of plan and process ontologies for representing declarative domain knowledge, and for task-based reasoning.

Sources of candidate ontologies and knowledge to compare or evaluate are:
DAML, DAML-S, RKF Process Ontology, NIST PSL, SPAR, Cyc,
Enterprise, TOVE, CoAX, C-CINC21

Sources of process models and SOPs to use within the proposed project are:
MIC/MPAT MOOTW SOPs http://www.mpat.org
Center for Army Lessons learned http://call.army.mil/
Navy Task List http://www.nwdc.navy.mil/UNTL_NMETL/UNTL_NMETL.htm

Development of Coalition Ontology and Knowledge Bases of Coalition SOPs

Part of the aim of the proposed work is to allow Austin Tate to continue to engage with and be involved in emerging efforts to create a shared ontology that can underpin task, process, event and process related knowledge and especially its use in coalition and international disaster relief operations. He will seek to involve himself where approved by the program managers in activities such as C-CINC21's coalition ontology, any follow on CoAX ontology work, and with emerging standards such as DAML-S, NIST PSL, etc.

A web site at www.i-rescue.org has been establish to act as a research prototype for the current proposed effort, and related student projects at Edinburgh, of the sorts of repositories for such materials now being created by the Multi-national Interoperability Council (MIC) for real multi-national missions by, for example, the USPACOM-led Multi-national Planning Augmentation Team (www.mpat.org). Austin Tate hopes to engage with groups like MPAT and similar efforts to exchange experience, concepts and results.

An extract from a communication related to MIC shows the potential importance of the "augmented messaging" approach advocated in this research proposal…

JOINT STAFF WASHINGTON DC//DJS//
Date: 141220Z May 02
Subject: MULTINATIONAL INTEROPERABILITY COUNCIL (MIC)
UNCLASSIFIED

...
4. MIC HAS MATURED TO WHERE IT HAS DEMONSTRATED ITS IMPORTANCE IN COALITION OPERATIONS. FOR EXAMPLE, IN ESTABLISHING THE 19-NATION INTERNATIONAL SECURITY ASSISTANCE FORCE IN AFGHANISTAN, THE UNITED KINGDOM USED MIC COALITION BUILDING GUIDELINES STANDARDS TO CONSTRUCT COMMON COMMUNICATIONS, GENERIC ROE, COMMON DOCTRINE, STANDARD AGREEMENTS FOR LOGISTICS SUPPORT AND MANY ADDITIONAL

COMMON PROCEDURAL AND OPERATING PROCEDURES. THIS "OFF-THE-SHELF" FOUNDATION FOR COALITION BUILDING IS SIGNIFICANT AND HAS GLOBAL IMPLICATIONS.

...

A report on the conduct of Millennium Challenge '02 from the person who played the leader of the opposing forces, General Paul Van Riper (previously the head of the US Marines), states "… nothing will remove the fog of war if messages and commands cannot be clearly expressed. All that fabulous technology – the ability to see round corners – is redundant unless soldiers know what to look for and how to make clear demands on others" [The Sunday Times, News Review, Page 5.11, September 22, 2002].

I-X Process Panels, and the underlying <I-N-C-A> ontology for expressing capabilities, commands, plans, activities, constraints and reports, and the related ontologies and grammars/lexicons for communicating content that is understood by the collaborating parties is the goal of the proposed work.

1.2 Technical Program Summary

To refine and develop task support capabilities for coalition and collaborative work based on I-X process panel technology and it's underlying <I-N-C-A> (Issues, Nodes, Constraints, Annotations) model. To show the synergy between task support and domain/agent relationship modeling and its relevance to the management of the dynamic context within which any agent operates in a coalition or collaboration. To make use of DAML and DAML-S research program results and provide relevant feedback into that community. To demonstrate the utility of the work within a realistic and militarily relevant scenario. To engage in suitable transition opportunities wherever they arise.

1.3 Risk Analysis

The work to be performed is to make use of infrastructure defined within the I-X research undertaken as part of the Coalition Agents eXperiment (coax) under the CoABS DARPA program. This gives some measure of robustness as these panels already operate in a rudimentary way, and can be connected to form a collaborating support environment. This is sufficient to begin exploration of the ontologies and semantic forms of the messages to be used in the chosen scenario.

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2.0 Special Technical Factors

2.1 Capabilities and Relevant Experience

For some time Austin Tate and Jeff Bradshaw, working together as PIs on the CoAX project (www.aiai.ed.ac.uk/project/coax) funded by the DARPA CoABS program, have discussed the areas in which synergy and links to emerging standards and ontologies to describe activity and capabilities can be made. However, the pace of demonstration development and transition work on CoAX has not allowed this to be further developed to date.

Both Austin Tate and Jeff Bradshaw and their teams appreciate realistic applied scenarios that are close to the interests of those with whom they wish to communicate and transfer their results. So having the SPAWAR generated C²SAR application and likely interests in this work at AFRL, NWDC and USPACOM has provided a welcome spur to this proposal.

Austin Tate has also been closely involved in the development of the emerging standards for process and plan representation and has been a member of or led many of the groups that have

created the initial offerings now moving towards international standardization (e.g. PIF, NIST PSL, SPAR). He and his team have been involved in comparative evaluation studies with DARPA, NIST and others of dozens of different candidate representations and ontologies in this research.

Work with DARPA to date, on the DARPA/Rome Lab. Planning Initiative and then the CoABS program, has provided a platform that has allowed Austin Tate to engage in other large-scale projects and for these to be effectively coordinated to gain rich international research cooperation. This cooperation is planned to continue within the current proposed project.

2.2 Previous or Current Relevant Research and Development

As a route to practical deployment of I-X concepts and the underlying <I-N-C-A> model, I-X Process Panels (I-P^2) are to be used as the basis for this work. When fully developed, they will provide tools and user interfaces to aid collaboration between a wide variety and large number of individuals, group participants and organizational entities in a way that allows them to cooperate, in a task-driven way, via the sharing and exchange of issues, activities, processes, constraints, reports and messages. They utilise a shared model of these entities that is intelligible to all participants. The context for any panel (it's "I-Space") can be dynamically configured to reflect the changing status of agents, domains in which they function, inter-agent authorities and policies. I-X Process Panels can function even when given limited knowledge. They can act anywhere in a continuum from tracking fully manually driven activity to initiating fully autonomous activity where permitted. They can allow for seamless integration of intelligent planning and dynamically responsive workflow determination and execution technologies to assist in the process of responding flexibly to emerging tasks and a changing environment as available capabilities and resources alter.

The I-X and <I-N-C-A> work links tasking, planning and activity execution (workflow) support agents with human agents to allow for a common shared “intelligible” model of tasks, processes, organisational structure, capabilities, agent status and presence, conversation policies, authorities and obligations and to explore these in realistic application. Features of the work are the re-use of suitable representations and technologies to act as the basis for this work, feedback to the contributing research communities and feed forward into a number of programs interested in the results.

2.3 Related Government Contracts

A current research grant to cover work on I-X Process Panels for Coalition Agents eXperiment is ongoing and comes to an end on 31st December 2002.

2.4 Facilities/Resources

Liaison assistance to the DAML program and the DAML-S work is being offered by the DARPA DAML Program through agreement with Dr. John Flynn of BBN in Washington DC – within current DAML funding. Scenario information is being provided by Jim Burdell at SPAWAR in San Diego.

3.0 Schedule

WP1 Task Support Ontology Comparative Study and Evaluation

Study of potential contributing ontologies from the DARPA DAML and RKF programs, NIST, C-CINC21, CoAX, etc. Feedback from experience on WP2 and WP3. Feed forward to WP4 and WP5.

Many common intuitions lie behind the DAML-S process ontology and the languages and ontologies developed previously for planning and process representation (e.g. NIST PSL, CPR, <I-N-OVA> and the CycL Process Ontology). However, significant differences in level of abstraction, scope, and knowledge representation language exist in the final formalised representations. The CoSAR-TS project will explore the (re)usability of plan and process ontologies for representing declarative knowledge about agents and their capabilities, and for task-based reasoning in multi-agent scenarios. The specific problem to be addressed in CoSAR-TS is the representation of some types of planning and activity management related agents, and the exchange of tasks, plans, activities, constraints and other task-related information between them. This will specifically try to describe I-X process Panels and their capability models in DAML-S. If time permits, a study of mapping between different ontologies in use in different systems may be explored and could enable the re-use of these process ontology contributions in open multi-agent systems.

FY03	SA	0.15 FTE

D1.1	<I-N-C-A> and DAML-S Report	Month 6
D1.2	Input to First Year Report	Month 12

WP2 Task Support Technologies

I-X Technology research and development for collaboration, task, process, event and activity management. Effort will be directed towards the use of DAML-S compatible capability descriptions of I-X process panels and ways in which organizational relationships between panels can allow them and their users to collaboratively work together with such external capabilities. The basis for this will be the outputs of the comparative study and concepts from WP1 and using research concepts from joint work between Edinburgh and IHMC/UWF in WP3.

FY03	J D	0.15 FTE

D2.1	I-X Version 3.1	Month 6
D2.2	I-X Version 3.2	Month 12

WP3 Task Support & Domain Management

Joint research and development of concepts to link domain management and task/process management concepts in collaborative and coalition domains. Discussions, proposals and papers by Austin Tate in cooperation, where appropriate, with Jeff Bradshaw at UWF/IHMC.

FY03	AT	0.1 FTE
FY04	AT	0.1 FTE
FY05	AT	0.05 FTE

D3.1	Collaboration Report V1	Month 12
D3.2	Collaboration Report V2	Month 24
D3.3	Collaboration Report Final	Month 36

WP4 Task Support to C²SAR Trials

Trial scenario development and Search and Rescue demonstration development - drawing on WP2 and WP3

FY03	AT	0.05 FTE
	JD	0.1 FTE
	SA	0.05 FTE

D4.1	C^2SAR Demo 1	Month 12

WP5 Technology Transfer, Reporting and Co-operation

Responsive mode Work Package to forge links to and transfer concepts and results to programs such as:

C-CINC21 Coalition Ontology
NWDC/Pinnacle Challenge '05
Multinational Interoperability Council/ USPACOM/MPAT SOPs
SPAWAR C^2SAR Scenario Interests
DAML Program, DAML-S, SONAT and Ontology Development
NIST/ ISO Process Representation Standards

FY03	AT	0.1 FTE
FY04	AT	0.15 FTE
FY05	AT	0.05 FTE

D5.1	Transfer Result 1	*
D5.2	Transfer Result 2	*
D5.*	Transfer Result *	*

* It is an aim of the project to engage with a number of programs, commands and groups seeking to develop and utilise knowledge systems for coalition operations of various kinds. Where possible I-X process Panel technology and related results will be provided to them for use as appropriate in their own work. Actual results to be transferred and the dates will be identified as the project progresses and will be reported via regular progress reports. Web materials to support such transitions will be created where appropriate as is usual for I-X project results.

4.0 Program Organization

4.1 Key Personnel

For some time Austin Tate and Jeff Bradshaw, working together as PIs on the CoAX project (www.aiai.ed.ac.uk/project/coax) funded by the DARPA CoABS program, have discussed the areas in which synergy and links to emerging standards and ontologies to describe activity and capabilities can be made. However, the pace of demonstration development and transition work on CoAX has not allowed this to be further developed to date.

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Austin Tate has also been closely involved in the development of the emerging standards for process and plan representation and has been a member of or led many of the groups that have created the initial offerings now moving towards international standardization (e.g. PIF, NIST PSL, SPAR). He and his team have been involved in comparative evaluation studies with DARPA, NIST and others of dozens of different candidate representations and ontologies in this research.

Stuart Aitken is currently the Edinburgh Co-PI on a project for the DARPA/RKF program working with CycCorp on including process and plan related representations and reasoning capabilities into Cyc. He will act as the link to DAML and RKF programs through involvement in the comparative studies, capability description and ontology re-use work in the proposed project.

Jeff Dalton (an US citizen) is the principal system developer for the I-X systems at AIAI, which will provide the technical basis for the demonstrations and developments directed at addressing the demonstration scenarios.

Stuart Aitken and Austin Tate are also involved in the OntoWeb network of excellence and Austin leads its working group on semantic web content standards for business processes (www.aiai.ed.ac.uk/project/ontoweb) - a group that includes DAML-S representation.

Work with DARPA to date, on the DARPA/Rome Lab. Planning Initiative and then the CoABS program, has provided a platform that has allowed Austin Tate to engage in other large-scale projects and for these to be effectively coordinated to gain rich international research cooperation. This cooperation is planned to continue within the current proposed project.

4.2 Management and Technical Team

	FY 2003	FY 2004	FY 2005
Austin Tate (AT)	0.25	0.25	0.1
Jeff Dalton (JD)	0.25	0.1	
Stuart Aitken (SA)	0.2		
Total	**0.7**	**0.35**	**0.1**

The PI, Austin Tate, is to dedicate 0.25 of his time in year 1 and 2 and 0.1 of his time in year 3 to the project to allow him to continue to interact in a flexible and extensive way with the US research community. Austin Tate is PI on related projects and the results of these will be exchanged where helpful into the proposed project. The main UK projects involved at present are Advanced Knowledge Technologies (www.aktors.org) and Collaborative AKT in the Grid (4 man years per annum for 2 years from June 2002 involving 3 universities (www.aktors.org/coakting). These are in areas directly related to the proposed research and outreach or transition proposals included here and will be drawn upon to provide the technical base to achieve results well beyond those achievable within the currently proposed project.

The costing includes staffing costs, 75% overhead on this sum which also allows for support, admin and other costs, computing charges and costs including the necessary network connection charges and computing staff costs, travel (see below) and a small “other costs” item to allow the project to purchase books, magnetic storage materials and presentation materials.

The project includes a travel budget for year 1 and appropriate continuing travel allowances for years 2 and 3 to facilitate the rich interaction expected between the Edinburgh team and a number of US programs and commands. In year 1, 4 single person trips to the US (alternately East and West coast for costing purposes) are included. One trip is budgeted for an extended stay to increase the opportunity for rich interaction and discussions between Austin Tate and Jeff Bradshaw. In years 2 and 3, 3 trips per annum are included. This will, at a minimum, allow for

continued attendance at appropriate DAML program meetings and collaboration between Austin Tate and Jeff Bradshaw.

4.2.1 Prime Contractor Responsibilities

The Principal Investigator Prof. Austin Tate in AIAI at the University of Edinburgh is responsible for all aspects of the work program and deliverables.

4.2.2 Subcontractor(s) Responsibilities

None.

4.2.3 Consultant(s) Responsibilities

None.

4.3 Resumes of Key Personnel

Austin Tate is Technical Director of the Artificial Intelligence Applications Institute (AIAI) and holds the Personal Chair of Knowledge-Based Systems at the University of Edinburgh. He is a Fellow of the Royal Society of Edinburgh.

Prof. Tate graduated with First Class Honours in Computer Studies from the University of Lancaster and received his Ph.D. in Machine Intelligence at Edinburgh in 1975. He is a Chartered Engineer and an elected Fellow of the American Association for AI. As well as engaging in the research, development and application of knowledge-based methods, he also has a background in data bases and software engineering.

Prof. Tate is an international authority on Knowledge-Based Planning and Activity Management Systems and is involved with industrial and governmental organisations deploying AI technology in the UK, Europe, Japan and the USA. He provides technology foresight support to a number of organisations. He is involved in international knowledge systems and workflow process standards activities and his O-Plan and I-X planning and activity management research has been supported by the US Defense Advanced Research Projects Agency (DARPA) and the US Air Force Research Laboratory (Rome, NY) Programs. Work has involved Command, Planning and Control for activities such as Non-combatant Evacuation Operations, Air Campaign Planning (including work with the Pentagon), US Army Small Unit Operations, Disaster Relief and Coalition Operations. A number of defence related projects in the UK and internationally have involved Search and Rescue Coordination and Coalition or Joint Forces Planning Aids.

Prof. Tate is Assistant Editor-in-Chief of IEEE Intelligent Systems, and has published extensively. He is a Fellow of a number or organisations: the American Association of AI, European AI, the British Computer Society, the British Interplanetary Society and the Workflow Management Coalition.

Jeff Dalton Jeff Dalton is a senior computer scientist at AIAI. His research interests include AI planning algorithms, programming languages, and Web-based systems. He received an AB in

Mathematics from Dartmouth College and was a member of X3J13, the technical committee that developed the ANSI Common Lisp standard**.**

Stuart Aitken gained a Ph.D. in the Faculty of Engineering of the University of Glasgow in 1990. Since then he has worked in Artificial Intelligence and Human-Computer Interaction. Dr. Aitken is currently the Edinburgh Co-PI on a project for the DARPA/RKF program working with CycCorp on including process and plan related representations and reasoning capabilities into Cyc.

5.0 Appendix -Interested Parties for Transition Opportunities

Jim Burdell, US Navy Space and Warfare Systems Center (SPAWAR) jburdell@spawar.navy.mil

Nort Fowler, AFRL Northrup.Fowler@rl.af.mil

Wayne Bosco, AFRL/IFTB Contracting Wayne.Bosco@rl.af.mil

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Jens Jensen, Assistant Director for Crisis Operations, USCINCPAC (J30-OPT), USPACOM/MPAT jjensen@poidog.pacom.mil

Scott Fouse ISX for C-CINC21 sfouse@isx.com

Rich Coupland and Paul Schmitt, NWDC and Olympic Challenge'04 coalition agents thread - couplanr@nwdc.navy.mil

Proposed DARPA NICCI. Program - I-X Process Panels for Command, Control and Intelligence (I-CCI) contributions to dynamic task and context management.

Murray Burke, DARPA IXO for a range of DAML/RKF evaluation and transition opportunities mburke@darpa.mil

John Flynn, BBN Technologies for DARPA DAML Program Transition jflynn@bbn.com

PART II - Contractor Statement of Work

1.0 OBJECTIVE:

To refine and develop task support capabilities for coalition and collaborative work based on I-X process panel technology and it's underlying <I-N-C-A> (Issues, Nodes, Constraints, Annotations) model. To show the synergy between task support and domain/agent relationship modeling and its relevance to the management of the dynamic context within which any agent operates in a coalition ort collaboration. To demonstrate the utility of these concepts within a realistic and militarily relevant scenario.

2.0 SCOPE:

COSAR-TS is a project to link domain and task management software agents with human agents to allow for a common shared "intelligible" model of tasks, processes, organizational structure, capabilities, agent status and presence, conversation policies, authorities and obligations and to explore this in a realistic application. Features of the work are the re-use of suitable ontologies to act as the basis for this work, feedback to the contributing research communities and feed forward into a number of programs interested in the results.

3.0 BACKGROUND:

We will build on the DARPA CoABS program funded work on I-X Intelligent Process Panels and their underlying <I-N-C-A> (Issues, Nodes, Constraints and Annotations) constraint-based ontology for describing processes and products (www.i-x.info). The process panels provide a simple interface that acts as an intelligent "to do" list that is based on the handling of issues, the performance of activity or the addition of constraints. It also supports semantically task directed "augmented" messaging and reporting between panel users. It can provide links to agent relationship management and visualization of agent presence, status or availability. A common ontology of processes and process or collaboration products based on constraints on the collaborative activity or on the alternative products being created via the collaboration is the heart of this research. We envisage the creation of a library of process models to support the issues, options and constraints associated with common types of collaboration.

The majority of the further development of the I-X technology for task and activity management is funded elsewhere and the currently proposed project is mostly intended to draw on these results to refine and communicate the concepts and techniques in a realistic scenario of interest to those to whom we wish to transfer the concepts and developments.

4.0 TASKS/TECHNICAL REQUIREMENTS:

4.1 The contractor shall accomplish the following:

4.1.1 Refine and develop task support capabilities for coalition and collaborative work based on I-X process panel technology and it's underlying <I-N-C-A> (Issues, Nodes, Constraints, Annotations) model. To deliver two releases of the I-X Process Panel software system taking into account requirements of the C^2SAR scenario.

4.1.2 Show the synergy between task support and domain/agent relationship modeling and its relevance to the management of the dynamic context within which any agent operates in a coalition or collaboration. The work to be reported via suitable technical papers and publications.

4.1.3 Make use of DAML and DAML-S research program results and provide relevant feedback into that community. The results will be documented via suitable technical papers and publications.

4.1.4 Identify HPC community members with relevant applications to experiment with the ALPHA version of the CG from paragraph 4.1.1 and the general HPC design environment from paragraph 4.1.3.

4.1.5 To demonstrate the utility of the work within a realistic and militarily relevant scenario. The results to be demonstrated at an appropriate workshop or other occasion.

4.1.6 To engage in suitable transition opportunities wherever they arise. The results to be documented in progress and final reports.

4.1.7 Reporting.

4.1.7.1 Provision of AFRL Jiffy System (or such alternative as directed) Quarterly reports on the status of the effort and report progress toward accomplishment of contract requirements.

4.1.7.2 Provision of AFRL Jiffy System (or such alternative as directed) Quarterly reports on the status of expenditure and the funding required for contract performance

4.1.7.3 Document all technical work accomplished and information gained during the performance of this research.

4.1.7.4 Provision of a Final Technical Report at the end of the contract term.